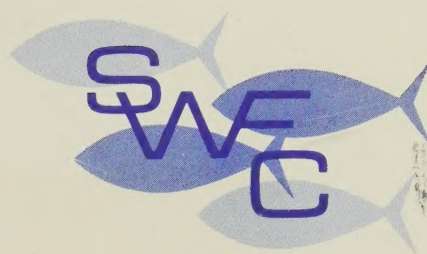




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MONTHLY REPORT - JUNE 1981

TABLE OF CONTENTS AND RESEARCH HIGHLIGHTS

	Page
PUBLICATIONS	1
HONOLULU LABORATORY	6
New Data Handling Procedures Created	7
Analysis of Seabird Feeding Habit Data Begins	11
LA JOLLA LABORATORY	12
International Field Experiments on Plankton Microstructure Conducted in Norwegian Fjord	16
1981 Albacore Tuna Forecast Issued	18
TIBURON LABORATORY	28
Rock Crab Marketed in San Francisco	31
A New Sea Urchin Plant Open in Los Angeles	31
SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS	34
PRINTRONIX Printer and TermiNet Terminal Approved	34
New Monthly PACES Reports Developed	34
MISCELLANEOUS	35
Honors and Awards, Seminars, Public Affairs, Visitors Meetings and Travel, and Personnel	35

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PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - JUNE 1981

STATUS OF PUBLICATIONS

Published

Alvarino, Angeles. 1981. Spadella legazpichessi, a new benthic chaetognath from Enewetak, Marshall Islands. Proc. Biol. Soc. Wash. 94(1):107-121.

Spadella legazpichessi is described from adult mature individuals and compared with related species, S. schizoptera, S. moretonensis, S. johnstoni, S. sheardi, S. nana, S. pulchella, S. hummelincki, with which it agrees in the presence of adhesive digital organs. The diagnostic characteristics of these species and S. legazpichessi are compiled in a table together with information on their geographical distribution.

MacCall, Alec D. 1980. The consequences of cannibalism in the stock-recruitment relationship of planktivorous pelagic fishes such as Engraulis. In: Gary Sharp (Rapporteur), Workshop on the effects of environmental variation on the survival of larval pelagic fishes. UNESCO, Intergovernmental Oceanographic Commission, Workshop Report 28:201-220.

Quantitative analysis of anchovy stomach contents, and a random filter-feeding model, both independently indicate that cannibalism is an important source of density-dependent mortality of eggs and larvae. The ratio of density-independent to density-dependent mortality of eggs and larvae is approximately 10 to 1. Variability in mortality rates should result in a log-normal probability distribution of recruitment strengths. While cannibalism is usually assumed to result in a Ricker stock-recruitment curve, expansion and contraction of spawning range with changes in stock size will tend to eliminate the descending

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limb of the curve. Harvests taken from the center of the stock should have a smaller impact on productivity than would equal harvests taken from the periphery of the stock.

MacCall, Alec D. 1980. Population models for the northern anchovy (*Engraulis mordax*). Rapp. P.-v. Reun. Cons. int. Explor. Mer. 177: 292-306.

The low anchovy central stock biomass in the early 1950's was probably due to a series of reproductive failures rather than to competition from the Pacific sardine. The pattern of anchovy population growth since 1951 can be empirically described by a logistic growth curve, which forms the basis of a population growth model. Estimated maximum equilibrium yield (484,000 short tons/year) is higher than maximum growth rate (353,000 short tons/year) due to competing risk of death and discontinuous reproduction. Asymptotic maximum spawning biomass is 3.9 million tons.

A stochastic population growth model was derived from the deterministic logistic model by considering error in annual population size predictions. This model was implemented as a Markov process with various biomasses as states, and stationery transition probabilities based on a given harvest policy. The stable probability distribution indicates that the resource is highly variable in a natural unharvested state. Management policies can be examined by the model, providing expected values, variances, and probabilities of various events or conditions. The present management policy of allowing a reduction fishery to harvest one third of the excess over 1 million short tons' spawning biomass could be expected to have a mean annual yield of 443,000 short tons and a mean spawning biomass of 2.75 million short tons.

Owen, Robert W. 1981. Fronts and eddies in the sea: mechanisms, interactions and biological effects. In: A. R. Longhurst (ed.), Analysis of marine ecosystems. Academic Press, pp. 197-233.

The physical characteristics of ocean fronts and eddies are discussed, together with their ecological effects upon marine organisms. Fronts and eddies can mechanically affect local concentrations of organisms, conserve and translocate selected species groups, modify migration patterns, create reproduction refuges, and so on. By operating on food web stability, community structure, local population dynamics, phytoplankton production, etc., frontal and eddy activity in the open sea can significantly affect the composition, distribution, and population size of various marine species. Such quasi-ordered velocity fields, in concert with the food needs and environmental gradients which dictate the behavior and reproduction of these organisms, have accounted for quasi-ordered patchiness of marine organisms on widely different time and space scales.

Whipple, J.A., M.B. Eldridge, and P. Benville, Jr. 1981. An ecological perspective of the effects of monocyclic aromatic hydrocarbons on fishes. In: F.J. Vernberg, A. Calabrese, F.P. Thurberg, and W.B. Vernberg (editors), Biological monitoring of marine pollutants, Academic Press, p. 483-551.

Recent investigations of the sources of monocyclic aromatic hydrocarbons (MAH) and their potential effects on aquatic resources indicate that this hydrocarbon class is prevalent in estuarine ecosystems such as the San Francisco Bay-Delta, and may constitute a chronic pollution threat. These toxic petrochemicals, interacting with other pollutants, could cause quantitative reductions in the production of fish populations by decreasing growth, reproduction, egg viability, larval recruitment and survival. There are also qualitative effects on fisheries, such as condition of fish flesh and increased parasitism and disease. In this paper the authors briefly discuss the sources and fates of MAH and summarize their effects on fishes.

The chronic effects of monoaromatics are examined in the context of a qualitative conceptual model, suggesting interactive effects of inherent environmental factors (abiotic and biotic). Variability in uptake, bioaccumulation and effects of monocyclics is considered in relation to inherent differences in fishes (e.g., interspecies variation, intraspecific variation in genotype, sex, age or life history stage and condition). The interaction of these inherent differences with certain environmental variables (e.g., temperature, salinity, pollutants and parasitism) is also discussed.

Monocyclic aromatics discussed include: benzene, toluene, xylenes, ethylbenzene and substituted benzenes, in general. Examples of fish species are drawn from our research in the San Francisco Bay-Delta area. However, most of these species are widely distributed into other areas. Species discussed include: striped bass (Morone saxatilis), starry flounder (Platichthys stellatus), Pacific herring (Clupea harengus pallasii), northern anchovy (Engraulis mordax) and Chinook salmon (Oncorhynchus tshawytscha). The possible relationship of selected genotypic differences to variability in uptake, bioaccumulation and effects is discussed for striped bass and starry flounder. Life history stages are also compared.

Uptake, bioaccumulation, translocation and depuration of these components are discussed in relation to effects in terms of hypothesized modes of action and alterations of structure and function (morphology, physiology and behavior). Many responses appear to be nonspecific responses to pollutant stress, but some specific effects (e.g., blood parameters) may also occur.

Approved by Center Director

- Au, David W. and Wayne L. Perryman. Movement and speed of dolphins responding to an approaching ship. For consideration for publication in the Fishery Bulletin, U.S.
- Lo, Nancy C.H. Simulated results of a commonly used ratio estimator applied to incidental dolphin mortality by U.S. tuna purse seiners in the eastern tropical Pacific. For consideration for publication in the Journal of Royal Statistical Society, Series C.
- Walker, Michael M., Andrew E. Dizon, and Joseph L. Kirschvink. Yellowfin tuna (Thunnus albacares) are easily conditioned to the geomagnetic field. For consideration for publication in Science (Wash., D.C.).
- Webb, P.W. and Raymond S. Keyes. Swimming kinematics and body form in sharks. For consideration for publication in Fishery Bulletin, U.S.
- Weber, Earl C. An analysis of the California swordfish harpoon fishery. For consideration for publication in California Fish and Game.
- Wetherall, Jerry A. Analysis of double-tagging experiments. For consideration for publication in Fishery Bulletin, U.S.
- Wetherall, Jerry A., and Marian Y.Y. Yong. Planning double-tagging experiments. For consideration for publication in NOAA Tech. Memo. NMFS-SWFC-13.

Administrative Reports

Honolulu Laboratory

- Polovina, Jeffrey J., and Darryl T. Tagami. 1981. A procedure to classify spiny lobsters as legal or sublegal based on tail widths. SWFC Admin. Rep. H-81-3.

La Jolla Laboratory

- Perrin, W.F., and C.W. Oliver. 1981. Time/area distribution and composition of the incidental kill of dolphins and small whales in the U.S. purse seine fishery for tuna in the eastern tropical Pacific, 1979-1980. SWFC Admin. Rep. LJ-81-14.
- Wahlen, B.E., and S.D. Boyer. 1981. Users manual for EVOLVE. SWFC Admin. Rep. LJ-81-15.

Translation

Ros, Rita Ma., and Rolando Menocal Rojas. 1978. A method of determining fecundity in decapod crustaceans with an external egg mass. Invest. Mar., Series 8, No. 40:1-19, October 1978. (Engl. transl. by Wilvan G. Van Campen for the Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812).

Erratum

An incorrect title was given for Administrative Report LJ-81-08 in the April 1981 Center Monthly Report. The following is the correct citation:

Coe, J.M. and P.J. Vergne. 1981. La modificacion de una red atunera de cerco obtinene [sic] el record de Baja mortalidad de delfines. [Modified tuna purse seine net achieves record low porpoise kill rate.] SWFC Admin. Rep. LJ-81-08.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Penultimate Resource Survey Cruise to the Northwestern Hawaiian Islands Completed

Richard N. Uchida, Leader of the Insular Ecosystem Study, reported that the NOAA ship Townsend Cromwell returned to Honolulu after completing cruise TC-81-03 around the island of Hawaii and French Frigate Shoals in the Northwestern Hawaiian Islands (NWHI). The cruise was divided into two parts: Part I was a cooperative cruise involving scientists from the University of Hawaii Sea Grant Program, and Part II, involving a variety of Task missions including experimental fish trapping, fish tagging, kona crab exploratory fishing, gear tests, and night-light observations and fishing. In addition, the recently-developed enzyme-linked immunoabsorbent assay (ELISA) kit developed by Drs. Y. Hokama and L. Kimura of the Cancer Center of Hawaii for the detection of ciguatoxin was field-tested aboard the vessel.

According to Bert S. Kikkawa, Chief Scientist on Part I of the cruise, the objective of the cruise was to survey and assess various physical, chemical, and biological parameters pertinent to energy flow, productivity, and mineral cycling in waters off Kawaihae on the island of Hawaii and off French Frigate Shoals. The scientific field party, including University of Hawaii Sea Grant scientists Dr. Jed Hirota, Robert Ferguson, James A. Finn, Alan Kam, Glen Lyle, Steve Reshkin, Satoru Taguchi, and Robert Taira, conducted several transects to measure salinity and temperature in relation to depth, measured in situ primary productivity using tracer elements and isotopes of carbon and nitrogen, collected plankton and larval fish with a variety of sampling gear, and made hydrographic observations to assess the physical characteristics of the water. As time permitted, the field party also conducted handline fishing for bottom fish and trolling operations for pelagic fishes.

According to Uchida, Chief Scientist on Part II of the cruise, the objectives of the second phase of the cruise were to (1) conduct fish trapping, holding, and tagging experiments, (2) test a hoop net, and (3) field test the ELISA kit. Assisting Uchida on the cruise were Research Assistants Alan R. Everson, Robert L. Humphreys, Jr., Bernard M. Ito, and Paul M. Shiota.

During field experiments on the cruise, the scientific field party successfully tagged and released 13 opakapaka, Pristipomoides filamentosus, 11 kahala, Seriola dumerili, 9 pig ulua, Caranx cheilio, 2 gindai, P. zonatus, and 1 each, hapuupuu, Epinephelus quernus, yellowtail kalikali, P. auricilla, and taape, Lutjanus kasmira. An unsuccessful attempt was made to decompress fish caught at 50 fathoms (91 m) in traps at 20 fathoms (36 m) for 24 hours.

During the cruise the Cromwell also provided transportation and other logistical support to a number of researchers making field observations in various locations in the NWHI.

Cluster Analysis Technique Used to Examine Northwestern Hawaiian Islands Fish Communities

Dr. Jeffrey J. Polovina, Statistician, and Edward Webman, Computer Technician, have been using multivariate techniques to study biological variation in the Northwestern Hawaiian Islands. An examination of the relative species abundance by bank, using cluster analysis on a sample of 2,371 bottom fish caught from the Cromwell over the last 5 years, suggests that the 13 banks in the NWHI can be aggregated into five groups representing relative abundance profiles of the various species. Necker and French Frigate Shoals form one cluster where an average trip to either of these banks results in a catch (by number) of principally opakapaka (51%) and equal amounts of ehu, Etelis marshi, (12%), and hapuupuu (12%). At the northwestern end of the chain, Midway and Kure form a cluster with an average catch profile consisting of hapuupuu (45%), ehu (29%), pig ulua (22%), and opakapaka (0%). Nihoa, Lisianski, and Pearl and Hermes Reef cluster together with an average catch consisting of principally ehu (51%) and hapuupuu (20%). The banks in the central part of the chain, consisting of Brooks, Gardner Pinnacles, Maro Reef, Laysan, and Raita Bank, cluster together with a relatively uniform mix of species consisting of hapuupuu (23%), pig ulua (20%), opakapaka (17%), ehu (14%), and kahala (11%). The Northampton Seamount forms its own cluster with a catch profile of gindai (33%) and ehu (14%).

Work Continues on Northwestern Hawaiian Islands Resource Survey Documentary Film

Reginald M. Gooding, Fishery Biologist, reported that work prints were made of original footage taken by personnel of the Honolulu Laboratory and the U.S. Fish and Wildlife Service (USFWS) for the planned 16-mm documentary film of the NWHI resource survey. This project is a cooperative effort by the Honolulu Laboratory, USFWS, University of Hawaii Sea Grant (UHSG), and the State of Hawaii, with funds from UHSG. Gooding, Statistician Dr. Jeffrey J. Polovina, and Dr. Robert Shallenberger of the USFWS viewed the available footage so that plans could be made for additional footage needs to be shot this summer. They are also looking for a qualified professional to handle the production.

New Data Handling Procedures Created

This month Research Assistant Darryl Tagami, who is the Insular Ecosystem Study Task's Data Manager, worked to develop a new format for recording shrimp catches on research and charter cruises, create secondary files by species for the Task's Size-Frequency Log, and, with Computer Technician Brent Miyamoto, machine edit the task's trap, pot, and net report. Tagami also discussed

documenting the Task's data sets and file-naming conventions with Fishery Biologist Fletcher V. Riggs.

Submersible Problems Cancel Spring Projects

Fishery Biologist Reginald M. Gooding reported that because the Hawaii Undersea Research Laboratory Project submersible, Makalii, was far behind on the schedule for recertification, all projects scheduled for this spring, including the one submitted by Gooding and Hobson, were cancelled. The Makalii will be at Enewetak during July-September. The Gooding-Hobson project has tentatively been rescheduled for October.

* * * * *

James H. Uchiyama, Fishery Biologist, and Research Assistant Darryl Tagami continued work on a manuscript entitled, "Length-weight and standard length-fork length relationships of deep-sea, handline-caught fishes of the Northwestern Hawaiian Islands."

FISHERY MANAGEMENT PROGRAM

Data Collecting Activities Reviewed

Dr. Robert A. Skillman and Ray F. Sumida, Fishery Biologists, traveled to Pago Pago, American Samoa, during the latter part of May to review the longline tuna/billfish data collection activities carried out by the Office of Marine Resources, Government of American Samoa, under contract to NMFS. They concentrated primarily on trying to find means for improving the return rate of logbooks; means to expand the collection of size measurements were also explored. Meetings were held with representatives of both tuna canneries, the Taiwan Fisheries Bureau, fishermen's associations for both Korea and Taiwan, and various fishing companies, in order to discuss a new logbook for catch and effort statistics for Korean and Taiwan boats; the logbook essentially follows the respective national forms but includes certain other fish species.

Because of the language problem, the fishermen's association and company representatives suggested that it would be more effective to work through them rather than directly with the boat personnel in getting the completed logbooks. They agreed to make available the national forms collected from the boats to the NMFS sampler.

Regarding size composition of the logline landings in American Samoa, a sampling program has been designed to obtain weight and sex from a subsample of the albacore, Thunnus alalunga, landings as well as lengths of yellowfin tuna, T. albacares, bigeye tuna, T. obesus, wahoo, Acanthocybium solandri, and skipjack tuna, Katsuwonus pelamis, landed by American purse seiners. One cannery reported having 12 purse seiners fishing off New Zealand and in other

areas in the western Pacific; they expect to have over 20 vessels in a few months.

Plans for reinstating reports summarizing the distribution of catch and catch-per-unit-effort (CPUE) in the American Samoa longline fishery were also completed. Computer listings have been completed for 1977 and 1978 and are now being mailed to American Samoa. Skillman and Daniel Locey, the Honolulu Laboratory's new NOAA Junior Fellow, are designing a contour printing computer program to be used in the reports issued on this fishery.

Skillman and Locey have also devised a data journal on a micro-computer to hold nonresearch-generated data and to keep track of all data used in analyses related to fishery management plans (FMP). This journal will essentially serve as a data dictionary and will contain information on which data have been received, their processing status in the Laboratory's data management system, and the file name in the tape/disk file library.

Domestic Fishery Monitoring Activities Increasing

In anticipation of expected regulatory requirements proposed in the draft FMP for spiny lobsters, personnel in the Fishery Management Program have been setting up a domestic fishery observer project. Fishery Biologists Robert A. Skillman and Ray F. Sumida have developed a daily logbook for catch and effort data and a landing trip report, both of which are required by the draft spiny lobster Fishery Management Plan. One proposed plan of the observer project is to test the validity of the carapace length-tail width relationship, which was recently computed by Statistician Jeffrey J. Polovina and Research Assistant Darryl Tagami, for lobster tails flash-frozen on commercial boats.

Research Assistants Bernard Ito and Gary Steiger have been monitoring the number of vessels participating in the spiny lobster and bottom fish fisheries in the NWHI. Research Assistant Gordon W. Tribble participated as an observer on a recent cruise of the domestic bottomfish boat, Wicked Wahine.

Meeting Called to Discuss FIN Activities

Richard S. Shomura, Honolulu Laboratory Director, this month called a meeting to prepare a PERT chart to integrate and coordinate the various data collection and management activities relating to the Southwest Fisheries Center's Fishery Information Network (FIN) for the central and western Pacific. Participating in the meeting were Dave Mackett, SWFC Planning Officer; Fred Kellenberger, SWFC Data Manager; Western Pacific Regional Fishery Management Council staff; Hawaii Division of Fish and Game staff; and several Honolulu Laboratory staff members.

Hawaii Skipjack Tuna Landings Continue Below Long-Term Average

The June 1981 Hawaii landings of skipjack tuna were estimated at 382 metric tons (MT), which is 130 MT above the June 1980 landings and 283 MT below the 1964-80 long-term average for May. The cumulative landings from January through June were estimated at 937 MT, which is 456 MT above the 1980 landings for the same period and 823 MT below the 1964-80 long-term average for the same period.

PELAGIC RESOURCES INVESTIGATION

More Skipjack Tuna Induced to Spawn

Dr. Andrew E. Dizon, Leader of the Pelagic Ecosystem Study, reported the successful spawning of more skipjack tuna using the "stress-induced" spawning method at the Kewalo Research Facility. Skipjack tuna caught on the FV Corsair at 1600 on May 30, 1981, were received by the Laboratory at 2200. Three females were stripped of ova at 0100 on May 31, 1981. The ova were fertilized using sperm collected from dissected testes (dry fertilization method). The fertilized ova were placed in a net enclosure overnight in slowly circulating seawater to rinse the ova and allow the unfertilized ova to sink to the bottom. The following morning the ova that remained floating on the surface were distributed into three larval rearing tanks at a density of 20 ova per liter. The tanks were filled with 200 liters of seawater filtered through 1-micron filters and treated with ultraviolet radiation.

All of the eggs hatched within 32 h after fertilization at 24.5°C. The larvae absorbed their yolk sacs and were feeding on rotifers, Brachionus plicatilis, by the third day after hatching. On the fourth day after hatching, the larvae were fed Tigriopus sp. (a harpacticoid copepod that is cultured at Kewalo). No major mortalities were experienced until the fifth day after hatching, when a mortality of approximately 50% was observed. This mortality is presumed to be due to dietary deficiencies--the larvae apparently cannot catch and feed on adult and copepodite stages of Tigriopus sp. due to their fast and erratic behavior. These mortalities continued on into the eighth day when only approximately 10 larvae were seen. Dr. James Brock of the Anuenue Fisheries Laboratory, State of Hawaii, checked the quality of the water in the larval rearing tanks and found that ammonia concentrations in the rearing tanks were approaching levels of toxicity. It was suggested that water in the rearing tanks be overturned 20% to 30% on a daily basis to prevent ammonia buildup due to high concentrations of larvae and prey organisms in the tanks. By the twelfth day after hatching, the only two remaining larvae died. All of the larvae that died from the eighth to the twelfth day had stomachs that were either empty or had only a few rotifers, again indicating dietary deficiencies. Plans for the next rearing trials include daily water changes and early introduction of high concentrations of nauplii and small copepodite stages of Tigriopus sp.

Analysis of Seabird Feeding Habit Data Begins

Thomas S. Hida, Fishery Biologist, began analysis of the large amount of data collected on the feeding habits of seabirds, a study which is being carried out in cooperation with Craig Harrison of the USFWS. The initial computer printout indicated that the white tern, Gygis alba, in total preyed on 33 different fish families plus squids and shrimps. Flyingfishes, Exocoetidae, ranked as the most important prey and Exocoetus volitans was the most important flyingfish, occurring in nearly 13% of the samples. Juvenile surmuilets, Mullidae, ranked second in importance. Other important prey ittems included squids of the family Ommastrephidae and juveniles of both species of mahimahi, Coryphaena hippurus and C. equiselis, and the needlefish, Ablennes hians. Of interest in the prey items were juvenile sailfish, Istiophorus platypterus, blue marlin, Makaira nigricans, and swordfish, Xiphias gladius. Other interesting prey items included juvenile hawkfish, Cheilodactylus vittatus, slender snipefish, Macrorhamphosus gracilis, and Laysan Island grouper, Grammatonotus laysanus. The average size of the most important measureable prey items ranged from 29.4 to 79.5 mm.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

Division Leader Attends Conferences on Fisheries Ecology

This month Dr. Reuben Lasker, Leader of the Coastal Fisheries Resources Division, attended two conferences on fisheries ecology. At a meeting in Woods Hole, Massachusetts, June 8-11, Dr. John Steele, Director of the Woods Hole Oceanographic Institution, organized discussion sections concerning on-going fisheries research in the U.S., the major problems that need to be attacked, and the relative roles of academia and government in solving these problems.

Lasker, along with Dr. Richard Parrish, Fishery Biologist with the Pacific Environmental Group (PEG), also participated in a second conference, sponsored by the International Scientific Committee on Ocean Research (SCOR). At the working group meeting held in Beaufort, North Carolina, at the Duke University Marine Laboratory, June 15-18, participants discussed the effect of the environment on fish populations. Dr. Richard Barber of Duke University hosted the session.

Reports from both meetings are currently being prepared for distribution.

COMMERCIAL AND RECREATIONAL FISHERIES FOR MANAGEMENT PROGRAM

Anchovy Spawning Biomass Estimate is Calculated

Dr. Gary Stauffer, Fishery Biologist, reports that the biomass of the central subpopulation of the northern anchovy during the 1981 spawning season is estimated to be 2,803,000 short tons. This estimate is approximately 58% greater than the 1980 estimate of 1,775,000 tons, making 1981 the third consecutive year with an increase in the biomass estimate since the 1978 low of 1,304,000 tons. The estimate was calculated using data from four egg and larva cruises which surveyed the anchovy stock over its geographic range during the 6-month period from January to June 1981. The anchovy larvae in the plankton samples were sorted, counted, and measured, and the data were summarized to form the larva census information for estimating the anchovy spawning biomass. This egg and larva survey of the central subpopulation of the northern anchovy was conducted as part of the 1981 triannual CalCOFI survey of the California Current region.

Of the 255 stations occupied in the winter quarter, 56% or 143 contained anchovy larvae. For the spring quarter, 51% or 134 out of 260 stations contained anchovy larvae. The larva census compiled for the eight regions of

the central subpopulation is $11,127.4 \times 10^9$ larvae for the winter quarter and $14,164.3 \times 10^9$ larvae for the spring quarter. The combined winter-spring larva census, L_{ws} , is $25,291.7 \times 10^9$ larvae. The estimated annual larva census is $28,602.7 \times 10^9$ larvae, giving an annual spawning biomass of 2,803,000 short tons.

The 1981 larva census values for the winter and spring quarters and the resulting biomass estimate are nearly identical to survey results for 1964 and, more recently, 1972. The optimum yield for the central subpopulation in 1981/82 fishing season is 601,000 short tons, as specified by the yield formula given in the Pacific Fishery Management Council's Northern Anchovy Fishery Management Plan. Within the U.S. 200-mile Fishery Conservation Zone, the optimum yield is 420,700 tons. Of this, 12,600 tons are reserved for the non-reduction fisheries and 408,100 tons are available for the U.S. reduction fishery.

The geographic distribution of anchovy larvae in 1981 has expanded somewhat further offshore compared to the past 3 years (see Figure 1). The number of larvae per station was low during the January 8101 cruise, but increased seven-fold during the February-March 8102 cruise. The peak occurred during the April 8104 cruise, with the number of larvae 50% greater than the 8102 cruise. By May-June the number of larvae per station had decreased to a level similar to that in January.

Larvae off central California were most abundant in the winter quarter cruises. Off Baja California, anchovy larvae were most abundant during the March and April period. Few larvae were taken there in the January and June cruises. The Southern California Bight contained the largest portion of the anchovy larvae. For the first time since 1975, a number of anchovy larvae were found offshore of southern California during the 8104 April cruise. The large size of the larvae in the offshore region suggests that the larvae were relatively old and were probably carried offshore by the California Current and upwelling plumes arising off central California. Andrew Bakun, Oceanographer with the Pacific Environmental Group (PEG), reports that the first major upwelling of the 1981 season occurred during the period March 26-April 9 off central and southern California.

Anchovy Spawning Geography Analyzed

Alec MacCall, California Fish and Game Marine Biologist stationed at the La Jolla Laboratory, has performed a multivariate analysis of anchovy coastal spawning centers. Winter and spring anchovy larva population estimates were calculated for each of the 24 CalCOFI lines from San Francisco to Magdalena Bay, Baja California, and for the 21 survey years from 1951 to 1979. Kendall's nonparametric coefficient of rank correlation was calculated for each pair of lines within a season. The resulting correlation matrices for winter and spring both show two coherent areas, one off central and southern California, and the other off northern and central Baja California. The division between the two groups is at the U.S.-Mexican border in the winter and off Newport Beach, California, in the spring. This provides circumstantial evidence of a biogeographic or oceanographic boundary within the Southern California Bight.

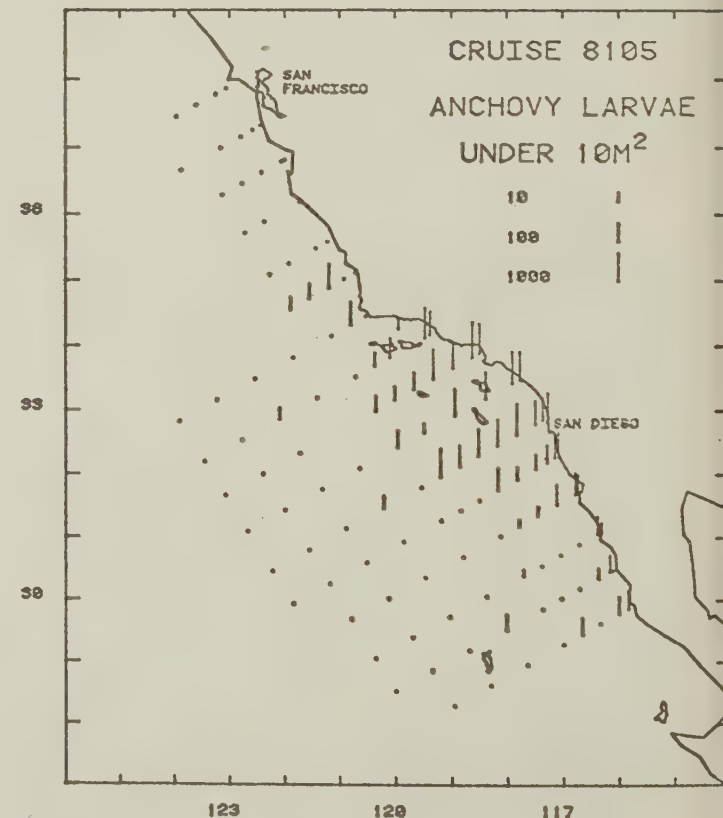
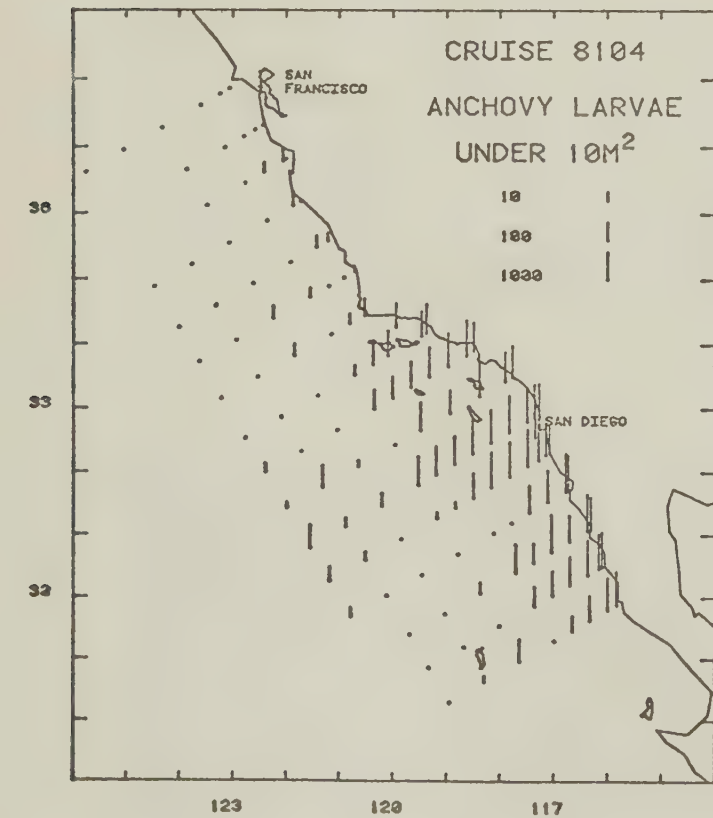
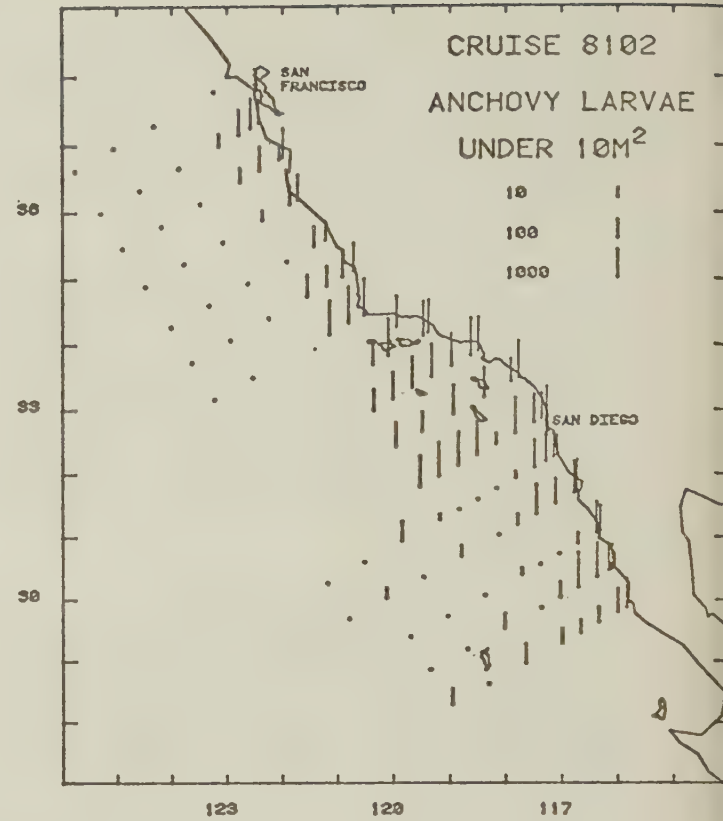
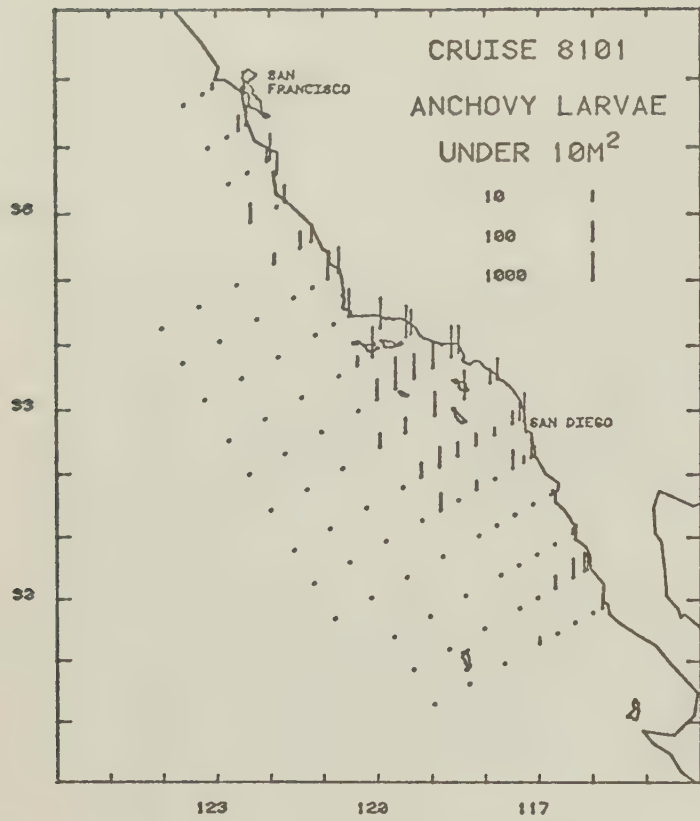


Figure 1. Occupied stations for the 1981 cruises and geographic distribution of anchovy larvae for the central subpopulation in the winter and spring. The vertical bars represent the logarithm of the number of larvae under 10 m² of sea surface.

The rank correlation matrices were subjected to a principal components analysis. This produces vectors of weighting factors which can be applied to the line population estimates in order to produce a single number (i.e., a "component") which explains the largest amount of variance in the pattern. Subsequent vectors may be estimated which, in turn, explain the largest amount of remaining variance independently of the preceding vectors. The principal components of the winter and spring correlation matrices indicate a coherent southern and central California pattern, as well as an independently coherent, and partially overlapping, northern and central Baja California pattern. While these patterns correspond well with accepted anchovy subpopulations, the overlap is more extensive and much farther north (i.e., from Ensenada to Los Angeles) than has been indicated by morphometric and genetic evidence of subpopulations.

A separate correlation matrix for winter lines with spring lines shows very little correlation along the main diagonal, except for southern California. This suggests that winter and spring are independent of each other for larval populations at most single locations. However, there are high correlations between southern lines in the winter, and more northerly lines in the spring. Some of this northward shift could be due to migration, but in most cases the distances are too great (up to 900 miles) for this explanation. An alternative hypothesis is that oceanographic conditions which are conducive to strong or weak spawning or recruitment, propagate northward along the coast from winter to spring. In addition, there are large negative correlations between winter spawning in the north and spring spawning in the south. Since winter and spring populations are nearly the same size in each year, these correlation patterns suggest that a significant portion of the variability in anchovy larva abundance may be due to environmental influences which are independent of adult population size.

Transfer of AMRMS Database to VAX System Continues

Susan Iacometti, Computer Specialist, reports that progress is being made on transferring the Aerial Marine Resources Monitoring System (AMRMS) data base from the Burroughs computer to the VAX. The files are linked from monthly to yearly increments before being read onto the VAX. Approximately half of the yearly files have been transferred so far. This transfer will allow the use of DATATRIEVE, a data base management system on the VAX computer. Two DATATRIEVE programs are working now and are used to check the accuracy of each transfer from the Burroughs. Other procedures are in the planning stages. Amy Kimball, NOAA Junior Fellow, is helping Iacometti to reduce the backlog in the coding of pilot logs for 1980 and 1981 aerial surveys.

Egg Production Methods Reviewed

Dr. Donald McCaughran of the International Pacific Halibut Commission submitted his technical review of the egg production method for estimating anchovy biomass to the Southwest Fisheries Center this month. In preparation for Dr. McCaughran's August visit to the Center, Statistician Susan Picquelle

has prepared a response describing the sample design for the trawl surveys and showing that the estimators of average weight, sex ratio, and spawning fraction are variants of the standard cluster sampling methods.

LARVAL FISHES, COASTAL EAST PACIFIC PROGRAM

International Field Experiments on Plankton Microstructure Conducted in Norwegian Fjord

Dr. Robert Owen, Oceanographer, has returned from Norway where he conducted field experiments to test the hypothesis that microscale layers of small plankton persist for periods up to 2 days and extend laterally for 10 m or more. Working under the especially quiet conditions which Skjomenfjord affords, Owen collaborated with Professor Gunnar Kullenberg and his physical oceanographers from Copenhagen University to form microscale layers of rhodamine dye by injection at depth, then to monitor their 3-dimensional behavior while repeatedly deploying the Micropatch Plankton Sampler (MPS) into the main dye layer.

The persistence and extent of small plankton patches is of interest because fish larvae which encounter such patches may be assured of a continuing food supply. The samples from Skjomen were sent to Dr. H-Chr. Eilertsen at the University of Tromso, Norway. Eilertsen will scan the samples and, if enough organisms of interest are present, will count them to determine concentrations of each population.

Study of UV Effects on Fish Continues

Dr. John Taylor and Sandy Kaupp report progress on their study of the effects of ultraviolet radiation on marine fish. Their research program is designed to elucidate the impact of stratospheric ozone depletion by man-made agents, with its accompanying increase in the penetration of bioactive ultraviolet radiation into the ocean. Emphasis has been given to commercially and ecologically important pelagic marine clupeoid fishes; the northern anchovy, Engraulis mordax, is used as the model species. The investigation is being sponsored by the U.S. Environmental Protection Agency through funds to the National Marine Fisheries Service, NOAA, and a contract between NOAA and the University of California, San Diego.

Cruise Plankton Samples Analyzed

This month Dr. Angeles Alvarino, Fishery Biologist, continued her analysis of plankton samples from the Velero and Opus I cruises, and from the Calvert collections obtained by the David Starr Jordan during cruise 8104. Alvarino identified species, counted numbers of individuals per species, and determined stages of maturity. Copepoda were counted by numbers of males and females per species; the number of mature females was also counted by

species. Specimens of the following groups were also found in the samples: Chaetognatha, Siphonophorae, Chondrophorae, Medusae, Ctenophora, Ostracoda, Cladocera, Heteropoda, Euphausiidae, Pteropoda, Foraminifera, Radiolaria, Tunicata, and dinoflagellates, as well as the larvae of Echinodermata, Mollusca, Decapoda, Polychaeta, Bryozoa, and some fish species.

* * * * *

Dr. Alvarino also has prepared an outline of a research project on Euclanidae for a graduate student at the Center of Marine Studies at UNAM. The student attended the plankton course which Alvarino taught at San Blas, Nayarit, in November 1980.

MULTISPECIES TAXONOMY PROGRAM

Developmental Stages of Anchovy Eggs and Yolk-Sac Larvae Studied

Dr. Geoffrey Moser, Leader of the Multispecies Taxonomy Program, reports that staff members of the MTP and the Larval Fishes, Coastal East Pacific Program collaborated on an experiment to determine the developmental stages of anchovy eggs and larvae at three temperatures. Fishery Biologist Carol Kimbrell organized the sampling procedures and, with the assistance of Fishery Aid Ragan Nichol, set up the rearing containers and temperature control baths at 13.5°, 15.0° and 16.5°C. Anchovy eggs were provided by Fishery Biologist Roger Leong from injected females.

Beginning June 25, egg samples were made every hour until all eggs were hatched at the three temperatures. Hatched larvae were measured and sampled every 4 hours until all larvae had reached the end of the yolk sac stage. This occurred on July 2 for the 13.5°C batch. Other participants in the sampling phase were Fishery Aid Morgan Busby, NOAA Junior Fellow Richard Kiy, Laboratory Assistant Susan Longinotti, Fishery Biologist Barbara MacCall, and Biological Technicians Elaine Sandknop and Betsy Stevens. The eggs will be staged by the staff of the Multispecies Taxonomy Group and the data will be used to calculate a temperature coefficient for anchovy egg development, critical to the anchovy egg/gonad spawning biomass technique. Moser will attempt to stage the yolk sac larvae based on eye pigmentation characters determined by the late David Kramer. Comparison on live and preserved lengths of the larvae will be used to establish a shrinkage coefficient for the yolk sac stage.

ALBACORE FISHERIES INVESTIGATION PROGRAM

1981 Albacore Tuna Forecast Issued

On June 5, SWFC Director Dr. Izadore Barrett and Oceanographer Dr. R. Michael Laurs issued the 1981 albacore forecast for the U.S. fishery. The forecast was prepared by Laurs and the staff of the Albacore Fisheries Investigation at the SWFC. According to Laurs, the outlook for the 1981 U.S. albacore fishery is generally good. Albacore were expected to be available in waters off northern Baja and southern California by late June, with favorable ocean conditions for fishing.

This conclusion was based upon existing favorable oceanographic conditions, and the fact that the southern substock did not migrate as far into the central Pacific during the 1980-1981 winter as it did in recent winters. In addition, surface mixed layer depths off southern California are nearly 10 meters (30 feet) less than long-term averages in late May-early June. This shallower surface layer has the potential for warming faster than normal and could act favorably to make albacore more vulnerable to surface fishing.

The forecast anticipated that the "northern" group(s) of albacore, which are caught by the U.S. fishery off the Pacific Northwest, would arrive several weeks earlier than has been the case in the past several years. Fish could be available off northern California and Oregon by mid-July. A contributing factor is the condition of oceanic fronts at the boundaries of the North Pacific Transition Zone (NPTZ), especially the Subtropic Front at the southern edge of the NPTZ, which were well-developed during the past winter and even more so during the spring. These oceanic frontal conditions could concentrate and speed the rate of migration of fish, causing an early arrival of albacore off the Pacific Northwest. The forecast estimates that approximately 60% of the catch will be taken north of San Francisco and 40% in waters to the south.

The National Marine Fisheries Service will issue albacore fishery advisory information throughout the 1981 season. This will include narrative albacore fishing bulletins and daily broadcasts of albacore fishing information over marine and commercial radio bands. Sea surface temperature charts are also being issued by the National Weather Service. The radio broadcasts will be made twice daily on weekdays and once on Saturday mornings, beginning the week of July 6 and continuing through October 31 or until the albacore season ends. Nearly coast-wide reception of the albacore fishery advisory broadcasts will be available again next year. The schedules and frequencies for the broadcasts are as follows:

WWD (La Jolla, CA) on SB carrier frequencies 8644.1 and 17408.6 kHz
at 0645 and 1745 PDT weekdays and 0915 PDT on Saturdays.

NMC (Point Reyes Coast Guard) on SSB carrier frequency 8760.8 kHz
at 0645 and 1945 PDT on weekdays and Saturday mornings.

KRED (Eureka, CA) on commercial AM 1480 kHz at 1830 PDT on Monday
and at 0610 PDT Tuesday through Saturday.

KBBR (North Bend, OR) on commercial AM 1340 kHz at 0605 and 1805 PDT. Weekdays and Saturday mornings.
KAST (Astoria, OR) on commercial AM 1370 kHz at 0555 and 1805 PDT. Weekdays and Saturday mornings.
KNPT (Newport, OR) on commercial AM 1310 kHz at 0615 and 1830 PDT. Weekdays and Saturday mornings.

Satellite Remote Sensing Applications in Fishery Research

Sea Truth Data Processed for Satellite/Fishery Study

Under the guidance of Oceanographer Ron Lynn, Michael Mason, Student Aid employed for the summer at the La Jolla Laboratory, began digitizing the analog traces of surface temperature and salinity collected by the thermosalinograph aboard the David Starr Jordan during the recent cycle of CalCOFI cruises. These data will be used as "ground truth" in the study of satellite thermal imagery collected contemporaneously with the cruises. This study of the satellite imagery and the thermosalinograph data will provide input for improved understanding of surface layer water mass differences and associated differences in biological sampling. The analog traces are being digitized at 3.7 km spacing (equal to a half unit in the CalCOFI station numbering system) and entered onto tape files of the HP-9825 using a program written by Lynn.

* * * * *

Dr. Ray Arnold from NASA headquarters in Washington, D.C. visited Dr. R. Michael Laurs this month to learn about satellite/fishery oceanography studies at the La Jolla Laboratory and to discuss plans for a CZCS (Coastal Zone Color Scanner) instrument being proposed to be placed on a TIROS-type satellite in the mid-1980s.

Oceanic Fisheries Resources Division

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

Dolphin Satellite Tracking Experiment Successfully Completed

This month Jacqueline G. Jennings, Fishery Biologist, and Raymond Stives, Biological Technician, successfully conducted a satellite tracking experiment of two spotted dolphins (Stenella attenuata) off Kona, Hawaii. Jennings was in charge of aerial spotting and tracking; Stives was responsible for photography and vessel operations, including catching the dolphins and attaching the transmitters.

A female adult spotted dolphin measuring 179 cm in length was caught on Sunday, June 7, the third vessel day. The best transmitter, Unit 1122, was placed on the animal and she was released with her school. An aircraft equipped with a receiving system similar to that of the NIMBUS-6 satellite tracked the animal for the next 7 days to collect ground truth information. The system, by HANDAR, included an automatic direction finder (ADF) receiver which indicated the length of the received signal (please see accompanying photographs).

Preliminary work by Jennings and Stives in May had confirmed that while normal surfacing times for dolphins were about 1.5 seconds, splashing significantly reduced the time the antenna was completely exposed (see SWFC Monthly Report, July 1980). The antenna has to be exposed for at least 980 msec in order to transmit the entire message to the satellite. Based on these results and analysis of dive patterns, the marine mammal transmitter design was modified to place the antenna on a 19 cm pedestal, the power was increased from 0.5 watt to 1 watt, the delay between triggering the seawater switch and transmission was lengthened to 100 msec, and the transmission repetition rate was increased from once every 14 seconds to once every 7 seconds.

Because the satellite recorder had failed several months earlier, the dolphin experiment had to compete with other programs for real-time coverage by the tracking station in Maui. A higher priority program eliminated coverage on Tuesday and, through a NASA administrative error, the animal was not tracked on Friday. The Maui tracking station does not operate during the weekend so no data could be obtained for Saturday or Sunday. NIMBUS-6 did receive signals and determine position locations for the animal on Monday, Wednesday, and Thursday. Fortunately, the plane's tracking system worked well; Jennings verified that the same number of signals were received by the plane's receiver as received by NIMBUS-6, thereby confirming that an adequate number of messages to determine position location could have been received each day of the week. Jennings was also impressed by the accuracy of position location: for example, the position location acquired through the satellite was 19°5.7' latitude, 156°6.4' longitude versus an actual position of 19°10' latitude and 156°2' longitude - a difference of about 14 nm.

A second animal, an adult male measuring 188 cm, was caught on the fourth capture day, Tuesday, June 9. The second transmitter, unit 1114, was placed on the animal which was released with the school. On Wednesday, five signals were received by the satellite from this animal versus 13 from unit 1122 on the female. It is not known if the difference is due to the pack being damaged, the behavior of the animal, or the electronics which had a history of poorer performance than unit 1122. No further signals from the pack were picked up by the tracking plane or the satellite. The animal was not seen again but could have left the area.

Unit 1122 performed well until the seventh day, Sunday, June 14, when poor quality signals were received by the tracking plane. The vessel was sent out Monday to verify the physical state of the transmitter. On Monday, no signals were received by the tracking plane or the satellite. The female was found still wearing the radio pack but attempts to recapture the dolphin with a hoop net originally used to capture it were unsuccessful. It was noted



Fishery Biologist Jacqueline Jennings monitors the signals received from the transmitter worn by a dolphin during an aerial survey. The receiver is similar to one in the satellite used to track the dolphin. The signal allows Jennings to direct the plane's pilot along the dolphin's track.



A spotted dolphin is shown wearing the satellite transmitter placed on it by Biological Technician Ray Stives. The antenna extends upward from the animal's back; the transmitter here is seen to the right of the antenna, around the dorsal fin.

that the antenna had broken off the pedestal. After several hours of attempting to catch the animal to recover the transmitter, the efforts were abandoned rather than risking killing the animal through exhaustion. The school was monitored by aircraft until Thursday and the plane and vessel went out again on Friday to try to locate and recapture the animal with a tail grab technique. The dolphin was caught, the pack removed, and the animal released. The nylon cable ties holding the pedestal side of the transmitter to the saddle had released since Monday, allowing that side of the transmitter to hang loose, causing considerable drag. There appeared to be dolphin teeth rakings on the pedestal, suggesting that other dolphins may have been biting the antenna; or it could have broken off from metal fatigue of the spring coil at the base of the antenna.

Jennings attributes much of the success in the field work to the competent and experienced experts on the team, which included an electrical engineer, Hank Fallek of HANDAR, who designed the plane's tracking system and supervised installation and testing of the equipment in the plane; Randy Wells, doctoral candidate at U.C. Santa Cruz, who assisted in dolphin spotting, identification, and handling; Dr. Bernd Wuersig, who recaptured the animal using his tail grab technique; Terry Power, who served as pilot of the tracking and spotting planes; Danny Comacho, the primary catcher who also advised on dolphin school movements and behavior; and Fulton Rapozo, skipper of the capture vessel, the Kelela Ana, who very ably maneuvered the vessel.

Coastal Marine Mammal Research Plan Drafted

A final draft of the Coastal Marine Mammal Research Plan has been completed by Dr. Duoglas DeMaster, Wildlife Biologist at the La Jolla Laboratory. The purpose of the document is to provide a summary of the objectives, information needs, priorities, and research activities of the Coastal Marine Mammal Program (CMMP). The CMMP's primary objective is decribed in the text as conducting research on the population biology and ecology of coastal marine mammals to obtain information necessary to determine the status of stocks and to provide advice on the effects of conflict activities on the stocks. Criteria for making assessments are described in the text and are based on indexing the rate of population change. Three levels of priority have been assigned to the species. The high priority species are Zalophus californianus (California sea lion), Phoca vitulina (harbor seal), and Globicephala macrorhynchus (pilot whale). In the text, a species-specific list of activities and schedules is presented. Research activities are outlined through 1985.

Marine Mammal Permit Appication Submitted for Tagging California Sea Lions

The Southwest Fisheries Center has submitted an application for a permit to take 1,600 California sea lions for tagging and release. San Nicolas, San Miguel, Santa Barbara, and San Clemente Islands are sites for the proposed take, which will be used to estimte pup survival, recruitment rates, age of sexual maturity, and site fidelity. A contract to C. Heath, U.C. Santa Cruz,

has been awarded to conduct tagging studies on California sea lions at Santa Barbara and San Nicolas Islands. Dr. Douglas DeMaster, Wildlife Biologist at the La Jolla Laboratory, will coordinate tagging studies on Zalophus at the other islands.

Unusual Dolphin Strands in San Diego County

On June 13, a northern right-whale dolphin, Lissodelphis borealis, stranded on Camp Pendleton Marine Corps Base adjacent to the Santa Margarita River. The animal, a 218 cm female, was recovered by Fishery Biologist John Henderson, Zoologist Aleta Hohn, and Michael Scott, Associate Scientist for the Inter-American Tropical Tuna Commission. A complete necropsy will be performed at a later date.

This specimen represents only the third known stranding of Lissodelphis in San Diego County since SWFC began keeping records in 1966. The species inhabits temperate waters of the North Pacific and is more commonly found in areas north of San Diego County. Several (10-20) Lissodelphis have stranded this winter in Santa Barbara and Ventura counties.

Necropsies Performed on 14 Stranded Sea Lions, 1 Elephant Seal

On June 10 and 11, Dr. Jay Sweeney, a marine mammal veterinarian under contract to SWFC, conducted necropsies on 15 pinnipeds which had stranded earlier this year. Dr. Sweeney was assisted by Fishery Biologists John Henderson and Virginia Cass, and Biological Aid Sandra Shay. Although final determination of cause of death awaits results of histopathological examination of tissue samples, some initial findings are noteworthy.

Lungworm (Parafilaroides sp.) was common in most animals, likely contributing to the debilitation and death of eight yearling sea lions and the elephant seal (a pup of the year). Gunshot was confirmed as cause of death for four sea lions (and ruled out in one animal previously thought to have been shot). An adult female sea lion died as a result of severe hemorrhage about the mammary tissue, probably induced by a large tumor.

SWFC to Co-Host Conference on Cetacean Reproduction

The Southwest Fisheries Center, together with the International Whaling Commission and the U.S. Marine Mammal Commission, will host a conference entitled "Cetacean Reproduction: Estimating Parameters for Stock Assessment" from November 27-December 7, 1981, at the Scripps Institution of Oceanography in La Jolla, California. The conference will consist of a 3-day symposium (November 28-30) and a 7-day practical workshop (December 1-7). Areas of concentration include collection and preparation of specimens and data, interpretation of biological material, and analysis of data.

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

T. Smith Returns from USSR

Dr. Tim Smith, Program Leader, this month returned from a visit with Soviet scientists in Batumi, USSR, where he participated in an aerial-ship survey of the Black Sea dolphins. Smith had an opportunity to witness aerial and shipboard survey methods for estimating abundance. A full report of his trip is being prepared.

Tuna/Porpoise-Related Data Prepared for Computer Usage

Dr. Tim Smith reports that testing for recently converted 1981 data editing programs is currently underway. EDP Programmer Celia Jacobs has been debugging and testing converted programs. According to Biological Technician Bob Franco, testing for the 1981 aerial survey programs is nearing completion and the editing of 1981 aerial survey data will begin in July.

Historical cruise data from 1971 to 1973 have been encoded, keypunched, and loaded on the UCSD VAX computer. Specifications for required editing programs have been completed by Biological Technicians Tom Gronholt and Mike Gregory. Editing programs coded to these specifications were developed and turned over for testing. Test data have been completed for the set log edit and testing is underway for these programs.

Computer Programmer Ken Wallace, Computer Specialist Frank Ralston, and other staff members have completed and documented a plan for establishing data storage/access structures on the UCSD VAX. EDP Programmer Susan Boyer is preparing three of the necessary systems programs. Programs underway include an update program to be used in creating indexed files, a large data formatting subroutine to provide a P.I. emulator facility, and an element definition file to be used as an access dictionary.

TUNA/BILLFISH RESOURCES PROGRAM

Center Scientists Participate in ICCAT Skipjack Sub-Committee Meeting

This month Dr. Gary Sakagawa, Oceanic Fisheries Resources Division Chief, and Dr. Sam Herrick, Tropical Tunas Assessment Project Leader, participated in the International Commission for the Conservation of Atlantic Tuna (ICCAT) Skipjack Sub-Committee meeting. The meeting, held in Miami, Florida, from June 8-12, was hosted by the Miami Laboratory of the Southeast Fisheries Center. Also participating were representatives from Brazil, Cuba, France, Ghana, Japan, Spain and the USSR.

Participants at the meeting reviewed research projects for ICCAT's International Skipjack Year (ISY) Program. All ongoing research projects were found to be progressing smoothly, and participants were optimistic that activities to be initiated during the remainder of 1981 would be carried out successfully. A report of this meeting is being prepared by the ICCAT Secretariat.

Center Scientists Attend Workshop on Research Results and the Professional Fishery Biologist

The 1981 summer workshop sponsored by the American Institute of Fisheries Research Biologists, Southern California District, was held at Dana Point, California, on June 17, 1981. Dr. Ronald Rinaldo, Fishery Biologist at the SWFC, chaired the workshop, "The Application of Fisheries Research Results; Responsibilities of Today's Working Biologists," which focused on the many arenas where fisheries research results are presented and the approach a professional should take when conducting his/her research and presenting the results.

The workshop included a panel of experts: David Burney, United States Tuna Foundation; Charles Fullerton, California Department of Fish and Game; Joseph Greenough, Inter-American Tropical Tuna Commission; Dr. John Harville, Pacific Marine Fisheries Commission; Nancy North, Scripps Institute of Oceanography, UCSD; and Dr. Elizabeth Venrick, Scripps Institution of Oceanography, UCSD. The panelists shared their experiences and opinions on responsibilities of research biologists. Open and active discussion by participants on such topics as fisheries management councils, powerplant sighting administrative law judge hearings, and environmental impact statements, followed the presentations by the panelists. Dr. Izadore Barrett, SWFC Director, and 31 other SWFC staff members participated in the 1-day workshop.

ICCAT Inter-Sessional Billfish Meeting Held

This month Dr. Norman Bartoo, Temperate Tunas and Billfish Assssment Project Leader, participated in an inter-sessional Atlantic billfish meeting sponsored by the International Commission for the Conservation of Atlantic Tunas (ICCAT). The meeting, chaired by Dr. William Richards of the Southeast Fisheries Center, Miami, Florida, was held at the SEFC from June 15-20. The purpose of the meeting was to evaluate the existing Atlantic billfish data, perform corrections to the data where needed, and examine potential assessment methods for Atlantic billfish considering available data. A report of the meeting's results is in preparation and will be presented at the 1981 ICCAT meeting in November.

Final 1980 Fishery Statistics Submitted to ICCAT

Al Coan, Mathematician, and Robert Nydam, Computer Programmer, have completed compiling final statistics for total catch and sampled catch,

effort, and length-frequency for the 1980 U.S. tropical Atlantic tuna purse seine fishery. These data, compiled as part of the U.S. commitment to the International Commission for the Conservation of Atlantic Tunas (ICCAT), were forwarded to ICCAT on June 29, 1981. The final data indicate that in 1980, eight U.S. purse seiners participated in the Atlantic tuna fishery. Catches by these vessels included 2,087 MT of miscellaneous species. Seventy-nine percent of their catch and 92% of their effort was concentrated in the Gulf of Guinea off West Africa. A total of 2,021 fish from the catches of these vessels were measured for fork length.

Size composition data from Atlantic tuna catches of foreign vessels that transshipped their catches to Puerto Rico in 1980 were also submitted to ICCAT. Over 7,900 yellowfin, skipjack, bigeye, and albacore tunas from these catches were measured by Eugene Holzapfel, Biological Technician, for fork length. Analysis of these data indicate that more than 70% of the bigeye catch is comprised of fish less than 50 cm in length.

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Atlantic-caught tunas transshipped to Puerto Rico are sampled routinely for biological information by Biological Technician Eugene Holzapfel. Data on fork length, weight, and species composition are collected. Results of Holzapfel's sampling of baitboats during the period January 1-July 1, 1981, are listed below. Data collected from purse seine and longline vessels have not been analyzed yet.

Species	Gear	Number of samples	Number of fish sampled	Tonnage sampled (MT)
Yellowfin	Baitboat	2	95	65.97
Skipjack	Baitboat	1	3	0.8
Bigeye	Baitboat	1	18	5.8

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Forces That Shape Spawning and Recruitment Patterns in Reef Fishes Studied

This month Dr. Edmund S. Hobson, Investigation Leader, and Fishery Biologist Tony Chess joined Dr. W.N. McFarland, of Cornell University, at the West Indies Laboratory, St. Croix, U.S. Virgin Islands. (McFarland, who has collaborated with Hobson in studies of vision in fishes in California, has based his studies at the West Indies Laboratory for the past 5 years.) While at the Laboratory, the three will study the spawning patterns of reef fishes. These fishes have shown a widespread tendency to spawn late in the day, or early in the evening. In addition, when the larvae of these fishes settle out of the plankton to assume their reef-dwelling mode, they generally do so at night. Hobson, Chess, and McFarland hope to determine whether these temporal patterns represent adaptive mechanisms which reduce threats from planktivorous reef fishes.

They first collected plankton samples (Figure 1), then immediately collected samples of the planktivorous fishes for study of gut contents. These were taken: 1) at dawn (plankton were collected during the 10 minutes immediately before sunrise); 2) midday (between 1200 and 1300 hours); 3) late afternoon (plankton were collected 1 hour before sunset; fish were collected until sunset); 4) early evening (1.5 hours after sunset - plankton only); and 5) midnight (between 0000 and 0200 hours). Because lunar period is important, the series was completed three times: during the first and last quarters of the lunar cycle, and during the new moon.

Although the samples have not yet been examined, it is possible to use these materials to test several hypotheses developed from earlier studies at Santa Catalina Island, California, and at Enewetak Atoll, Marshall Islands. These hypotheses state: 1) Only diurnal predators are a significant threat to the eggs. 2) The late afternoon surge in spawning occurs while many diurnal planktivores still feed, but at this late hour light levels have fallen below those needed by them to detect the largely transparent eggs. (It is logical that spawning would begin as soon as the threat to the eggs is eased, so that there is maximum time for the eggs to be carried away from the reef before becoming vulnerable again to predators the next day.) 3) Some nocturnal planktivores feed heavily on the settling fish larvae, but they are far fewer than the many piscivorous predators that would threaten these larvae during the day.



Figure 1. Ted Hobson and Tony Chess sample the zooplankton above the reef at St. Croix, U.S. Virgin Islands.

Fishery for Widow Rockfish to be Assessed

Dr. William H. Lenarz, Leader of the Rockfish Analysis Task, has been assigned responsibility for assessment of the widow rockfish fishery by the Pacific Fishery Management Council's Groundfish Management Team. Lenarz prepared the first draft of the Team's preliminary assessments made at a meeting of the Team on June 9, 1981. The report has been sent to the Team for review and will be submitted to the Pacific Fishery Management Council at their July meeting.

Three Papers Written on Rockfish Studies

Dr. William Lenarz, Investigation Leader, this month completed a paper entitled: "Ageing and growth of widow rockfish," which is being prepared for review. Fishery Biologist Tina Echeverria completed and sent out for in-house review a paper co-authored with K. Fourre, a former Task employee, entitled: "A morphological feature to differentiate the blue rockfish (Sebastes mystinus) from the black rockfish (Sebastes melanops).". She has also nearly completed revision of a paper coauthored with W. Barss of the Oregon Department of Fish and Wildlife, entitled: "Maturity of widow rockfish (Sebastes entomelas) from the northeastern Pacific, 1977-1980."

FISHERIES DEVELOPMENT INVESTIGATION

Processing and Marketing Trials of Shortbelly Rockfish Reported

As part of a continuing effort to develop a fishery for shortbelly rockfish (Sebastes jordani), members of the Fisheries Development Investigation study processing as well as catch methods. This month Sus Kato, Task Leader, reports that results from trial machine-processing of shortbelly rockfish were supplied by the machinery manufacturer, Baader North America Corporation. Using a herring machine, the best speed in producing a headed-gutted-filletted product was 90 fish per minute. The yield was 40%, and "butterfly" fillets produced better overall results than conventional fillets. Problems were encountered in aligning the fish's head correctly, and in complete removal of guts. On another product, the company spokesperson feels that about 200 shortbelly rockfish per minute can be handled by existing heading and gutting machines. In addition to possible markets for headed and gutted fish, the output could be used to make "surimi," a minced fish product used in Japanese fishcake.

Other reports on the development of shortbelly rockfish markets have not been as encouraging. Preliminary reports from Japan on marketing trials of shortbelly rockfish indicated that the fish were slightly too small (especially regarding girth), and that the quality was mixed (the fish were either marinated in traditional sauces similar to some products made with

Pacific Ocean perch, or dried). Locally, dried shortbelly rockfish was found to be acceptable and one firm intends to produce limited amounts for the Filipino market in central California. However, a second fish dryer, in Los Angeles, decided against using shortbelly rockfish for the present because other, more commercially acceptable fish are readily available.

Rock Crab Marketed in San Francisco

Live rock crabs supplied to a San Francisco market by the staff of the Fisheries Development Investigation have been found to be acceptable to certain ethnic groups. Although commonly eaten in southern California, rock crabs are not marketed in the San Francisco Bay Area, probably because of the availability of fresh Dungeness crab. However, Dungeness crab, and another alternative, live blue crab from the east coast, are fairly expensive, a factor which may have influenced the choice of rock crabs by consumers. Further fishing and marketing trials will be made to determine if both catching and selling the crabs would be profitable. A recent attempt to catch the crabs at Point Reyes, California, with new plastic traps, was unsuccessful.

Exploratory Fishing for Euphausiids Underway

An euphausiid fishing trip aboard the chartered commercial trawler, Sanibel, began June 29, with the night fishing operations to be conducted in the vicinity of Monterey Canyon, California. Bob Glenn, owner of the Sanibel, was the successful bidder for the euphausiid charter cruise after the cancellation of an euphausiid fishing trip scheduled for early June off Bodega Bay, California. The owner of the vessel, Seal, who had indicated a wish to use the Tiburon Laboratory's euphausiid net on a trial basis, was unable to participate. The cancelled trip had been arranged by a local aquarium feed dealer.

Project Leader Bill Leet and Fishery Biologist Sennen Salapare will be aboard the Sanibel during the charter cruise. The catch will be packed by a Monterey processor to be freeze-dried later for trial marketing as aquarium fish food.

A New Sea Urchin Plant Opens in Los Angeles

This month members of the Fishery Development Investigation counselled principals of a new sea urchin processing plant that opened in Los Angeles in late June. The plant employs about 30 workers and hopes to process about 10 tons of urchins per day. This brings the total number of urchin companies to 11 in southern California, counting one other plant that opened recently in Santa Barbara. The California sea urchin fishery continues to grow despite reports of increasing difficulty in obtaining good quality urchins. Over 15 million pounds of red sea urchins are taken annually and most of the processed product--the roe--is shipped to Japan.

Octopus Fishing Trials to Begin Soon

In a continued effort to develop a fishery for giant Pacific octopus on the north coast of California, several of the octopus traps owned by the Tiburon Laboratory were transferred from Mendocino to a fisherman in Fort Bragg, California. Project Leader Patrick Rutten (NOAA Corps) reports that the cooperating fisherman has a vessel and sufficient gear for trial fishing, and should be able to demonstrate whether a directed fishery for octopus is feasible. Octopus traps and other gear are also being prepared for loan to a fisherman in Santa Barbara who is trying to catch the smaller species, O. bimaculatus and O. rubescens. Fishing trials are scheduled to begin in August.

Efficiency of Sail-Powered Fishing Vessel Studied

Economist Ed Ueber reports that the fishing vessel, Tiare, was contracted by the Tiburon Laboratory to supply 10 days of performance data when fishing for salmon and groundfish. These data will be used to determine energy savings, manpower requirements, and suitability of using sails while trolling for salmon and hook-and-line fishing for groundfish. Fishing in very rough seas, the vessel had a catch rate for salmon comparable to some other trollers. The vessel also proved well-suited for fishing with vertical longlines and rod and reel; excellent catches of rockfish and lingcod were made with these methods.

Ueber accompanied the Tiare during part of the contract study. Thirteen days of fishing data were received from vessel, 30% more than was contracted for. The owner also indicated that he might supply performance data from their transit to Hawaii, at a minimal cost to the Tiburon Laboratory.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Final Data Analysis to Begin on Pollutant Effects on Striped Bass

Dr. Jeannette A. Whipple, Investigation Chief, reports that data obtained during field studies on the condition of and pollutant load in striped bass (sampled from 1978 to 1980) are being checked in preparation for final data analyses. Preliminary factor analyses of these data show strong correlation between several parameters and pollutant load. Among these is a correlation between tissue concentrations of monicyclic aromatic hydrocarbons (MAH) and parasite types, abundance, locations, and host reactions. A high proportion of the fish are heavily parasitized; many of the subadults bear open lesions and adults show evidence of healed lesions.

These data led earlier to the hypothesis that pollutants may be stressing the striped bass, leading to decreased immunity to parasites and diseases. It

was also hypothesized that heavily parasitized fish might have higher accumulation and slower depuration of pollutants, and/or that parasites might increase the effect of toxic substances on striped bass.

A series of experiments is currently being conducted to test these hypotheses. Juvenile striped bass were first infected with parasites and are now being exposed to benzene (MAH) alone, zinc alone, and benzene and zinc together. The first two experiments have been successfully completed and the last is about to begin. Several measures of stress and effects on the bass are being made and analyses made of concentrations of pollutants in tissues. Preliminary results indicate that even at the low concentrations tested (approximating field chronic levels; 90 ppb benzene; 30 ppb zinc), there are effects on juvenile fishes. Data are being analyzed and specific results will be reported later.

Several investigators have been cooperating in the evaluation of effects of pollutants in these experiments, including: Dr. Michael Moser, University of California, Santa Cruz (parasite condition and inflammatory reactions); Dr. Joseph Cech and Steve Mitchell, University of California, Davis (effects on gill tissue-histology); Dr. Sefton Wellings, Kris Lindstrom, Bob Munn, and John Karnachi, University of California, Davis (histopathology; electron microscopy of several tissues); and Dr. Florence Harrison and Jackie Lam, Lawrence Livermore Laboratory (zinc concentrations and metabolism of zinc). Experiments on the combined effects of zinc and benzene on striped bass embryos and larvae have also been completed. Data and samples are now being worked up.

SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

PRINTRONIX Printer and TermiNet Terminal Approved

Dorothy Roll, Systems Analyst, reports that the NOAA and NMFS ADP Procurement and Policy Division has granted approval for the purchase of a line printer and printer terminal to replace the Data 100 remote job entry station. The PRINTRONIX is the only line printer marketed which, without special interface, operates in the plot/graphics mode by a computer command for plotting graphs, charts, characters, and any other images which can be displayed on a CRT.

The new teleprinter terminal is General Electric's TermiNet 200; it will communicate on a dial-up switchable 300/1200 baud line modem to host computers, such as ADP Network Services DEC 10, NWAFC (Seattle) Burroughs, and UCSD's Burroughs. The TermiNet is the only printer terminal marketed which has a keyboard send-receive (KSR) cassette unit. Data files can be entered off-line into the cassette and then transmitted on-line to the host computer. This data entry capability replaces the card reader function of the remote job entry station.

Conversion of FRS to ADP Network Begun

Oden Burris, Computer Programmer, and John Davies, Computer Specialist stationed at the Southwest Region, have begun the conversion of the Financial Reporting System (FRS) from INFONET to ADP Network Services. Burris is responsible for the data base declarations and the generation of the required reports from the system. Davies is responsible for the verification of data entries into the system. Targeted date is mid-August for processing the converted system in parallel with the INFONET system in order to fully test the system prior to full implementation on October 1, 1981.

New Monthly PACES Reports Developed

Fred Kellenberger, Data Systems Manager, reports that two new monthly reports were developed for the Pacific Area Enforcement System (PACES) during June. One report indicates the number of cases and boardings for the month and year to date and the other displays detailed information on individual boardings for the month. In addition, an agent resource activity report has been implemented for enforcement personnel and management.

Two Technical Users Meetings Held in June

ADP Operations hosted two computer technical users meetings during June. One session was conducted by Jerry Fitzsimmons, Chief Consultant at UCSD's Computer Center, in order to assess the rationale for SWFC's dependence on

magnetic tapes. He focused on tape usage on the VAX, a disk-oriented system. The other session was user's information exchange on the use of DATATRIEVE, the data base software on VAX.

* * * * *

Data files and report programs for the Market News system on imported products have been implemented on the ADP system. Reports will summarize the number of pounds imported by country and species during 1980.

MISCELLANEOUS

SWFC Solar Demonstration Project Due to be Completed in February 1982

Ben Remington, Executive Officer, reports that the estimated completion date of the installation of a sea water solar heating system at the Southwest Fisheries Center's La Jolla Laboratory will be February 1982 rather than December 1981 as reported in the May 1981 Center Monthly Report. The System will be installed by McCaughey & Smith Energy Association, Inc., under a Department of Energy Grant through the National Aeronautics and Space Administration (NASA). The preliminary design information indicates that approximately 30-40% of the sea water heating needs can be met by installing flat-plate collectors on the roofs of three of the existing buildings. A considerable savings in natural gas use is expected once the installation is complete and the system is operable.

HONORS AND AWARDS

Amy Kimball Awarded 1981 NOAA Junior Fellowship

Dr. Izadore Barrett, SWFC Director, announced that Amy Kimball, 17, has been chosen as the 1981 National Oceanic and Atmospheric Administration (NOAA) Junior Fellow at the SWFC's La Jolla Laboratory. This summer Kimball will work with various members of the Coastal Fisheries Resources Division at the La Jolla Laboratory.

The daughter of David B. and Linda M. Kimball of Point Loma, California, Kimball graduated from Point Loma High School this month. She has done independent research on limpets and received a Copley-Humphrey Memorial Grant to cover research expenses. For her research on "Ecological adaptations of *Acmaea digitalis*, an intertidal limpet," Kimball was awarded the first John D. Isaacs Memorial Scholarship by the California Sea Grant Program. This \$10,000 scholarship will be awarded annually at the California State Science and Engineering Fair for the best marine science project developed by a twelfth grade student. Kimball will use the scholarship when she attends UC-Santa Cruz beginning in the fall.



La Jolla Laboratory

On June 30 an awards ceremony was held at the La Jolla Laboratory and Dr. Izadore Barrett, Center Director, presented many staff members with certificates and cash awards. The recipients who appear in the photograph received awards on the basis of Outstanding Ratings. They are (from left to right): Susan Iacometti, Cash Award; Izadore Barrett; Charles Oliver, Quality Step Increase; Richard Charter, Outstanding Performance Recognition; Virginia Hostler, Quality Step Increase; James Coe, Quality Step Increase; Priscilla Sloan, Quality Step Increase; Al Myrick, Jr., Cash Award; Robert Nydam, Quality Step Increase; Raymond Stives, Cash Award; Frank Ralston, Quality Step Increase; John Henderson, Quality Step Increase; Tim Smith, Quality Step Increase; Ken Wallace, Outstanding Performance Recognition; Helen Becker, Quality Step Increase; Eric Lynn, Outstanding Performance Recognition.



Those who received awards based upon Outstanding Ratings but who do not appear in the photograph include: Rennie Holt, Quality Step Increase; Eugene Holzapfel, Quality Step Increase; Jacqueline Jennings, Cash Award; Dorothy Roll, Quality Step Increase; Lillian Vlymen, Cash Award.

Others who received awards include: Norman Bartoo, Cash Award; Al Coan, Jr., Cash Award; Nancy LaRoche, Quality Step Increase; William Perrin, Sustained Superior Performance (Cash Award).

Tiburon Laboratory

On May 31, William H. Lenarz, Fishery Biologist and Leader of the Rockfish Analysis Task, received an Outstanding Performance Rating (Quality Step Increase).

PUBLIC AFFAIRS

Tiburon Laboratory

On June 29 and 30, a documentary program on the pollution problems of the San Francisco Bay/Delta Estuary, entitled "Bye Bye Bay," was aired on public television, station KQED (Channel 9). Much of the program focused on the research being done by the Physiological Ecology Investigation Team led by Dr. Jeannette Whipple at the Southwest Fisheries Center, Tiburon Laboratory.

SEMINARS

Honolulu Laboratory

June 26 - Dr. George Habib, Fisheries Research Division, Ministry of Agriculture and Fisheries, Wellington, New Zealand, spoke on "Purse seining for skipjack tuna in New Zealand waters."

La Jolla Laboratory

June 9 - Howard Fraley and Dave Dixon, Northwest Administrative Office, NOAA, Seattle, Washington, discussed "Information on staffing function: changes in appointing authorities; applicant supply file; Merit Promotion."

16 - Dr. Ronald Rinaldo, Southwest Fisheries Center, presented a seminar on "Dynamics of the shrimp fishery in the Gulf of Maine."

18 - Peter Shelton, Sea Fisheries Institute, Capetown, South Africa, talked about "Hydrology, pelagic fish, and sea-bird predators in the southern Benguela system."

TRAINING

La Jolla Laboratory

- June 15-19 - Barbara Engstrand, Program Support Assistant - "Introduction to Supervision," San Diego, CA.
- 15-22 - Priscilla Sloan, Biological Technician - "Comparative Program Design," San Diego, CA.
- 24-26 - Dr. Izadore Barrett, SWFC Director, - "Executive Leadership," San Francisco, CA.

VISITORS

Honolulu Laboratory

- June 1-3 - Mr. Unar and Mr. Soewito, Directorate General of Fisheries, Jakarta, Indonesia.
- 8 - Jay L. Maclean, International Center for Living Marine Resources Management, Makati, Metro Manila, Philippines.
- 22 - Mr. Shinichi Kobayashi, Asst. Director, International Affairs Division, Fishery Agency, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan; and Samuel Lee, escort-interpreter, International Communication Agency Reception Center.
- 24-26 - Dr. George Habib, Fisheries Research Division, Wellington, New Zealand.
- 29 - Sang Jeong Park, Joo-Yeoul Lim, and Myeong Nam Kim of the National Fisheries Research and Development Agency, Busan, Korea.

La Jolla Laboratory

- June 1 - Bob Rowley, UCSB, Santa Barbara, CA.
- 4 - Peter Shelton, Sea Fisheries Institute, Cape Town, South Africa.
- 9 - Lew Wright, Western Fishboat Owners Association, met with Dr. Izadore Barrett, Center Director.

- 9-10 - Howard Fraley and David Dixon, NASO, NOAA, Seattle, WA visited the La Jolla Laboratory to speak to Center employees.
- 11 - Alberto Zirino, Naval Ocean Systems Center, San Diego, CA.
- 22 - Mr. S. Kume and Mr. Zuzuki, both from Japan, visited Dr. Gary Sakagawa.
- 23 - Ray J. Arnold, NASA Headquarters, Washington, D.C.
- 29 - Mr. James T. Movick, Deputy Chief for South Pacific Affairs, Department of External Affairs, Federated States of Micronesia Government, visited Center Director Dr. Izadore Barrett.
- Steve Bay, Philip Oshida, and Sandra Oshida, Southern California Coastal Water Research, Long Beach, CA.

Tiburon Laboratory

- June 6 - Peter Fricke, Office of Resource Conservation and Management, Washington, D.C.
- 17 - Bruce B. Collette, U.S. Museum of Natural History, Washington, D.C.
- Scott McCreary, Coastal Commission/Conservation Foundation, San Francisco, CA.
- 18 - Izumi Nakamura, Fisheries Research Station, Kyoto University, Kyoto, Japan.
- 19 - Thomas C. Cannon, Envirosphere Company, Concord, CA.
- 22 - Ronald C. Hess, California Department of Fish and Game, Menlo Park, CA.
- 23 - Susumu Kume, and Jiro Suzuki, Far Seas Fisheries Research Laboratory, Shimizu, Japan.
- 24 - Carla M. Bard, Chairwoman of the State Water Resources Control Board, and fellow Board member, Leo L. Mitchell, visited the Tiburon Laboratory to examine the facilities, and discuss research being performed in the Cooperative Striped Base Study.
- 26 - Richard D. Methot, Jr., U.C. Bodega Marine Laboratory, Bodega Bay, CA.

MEETINGS AND TRAVEL

Honolulu Laboratory

- June 8-10 - Richard Shomura, Laboratory Director, participated in the 30th Western Pacific Regional Fishery Management Council meeting held on Maui.
- 16 - Richard Shomura attended the Billfish FMP public hearing at the Pagoda Hotel.
- 17 - Richard Shomura participated in a meeting of the Coordinating Council on Research-Northwestern Hawaiian Islands (CCR-NWHI) held in the Honolulu Laboratory conference room.
- 23-26 - David J. Mackett, SWFC Planning Officer, met with Honolulu Laboratory staff to assist in developing PERT charts for Honolulu Laboratory research programs on (1) Hawaiian monk seal, (2) NWHI fisheries resources, (3) Council-related activities, and (4) Resource Assessment Investigation of the Mariana Archipelago (RAIOMA).

La Jolla Laboratory

- May 15- June 15 - Robert Owen traveled to Copenhagen, Denmark, and Bergen, Norway, to conduct experiments in Norwegian fjord with Danish/Norwegian scientists.
- May 26- June 15 - Dr. Daniel Huppert traveled to Seattle, WA to research and write a paper for the September 13-16 Workshop on Ocean Resource Economics to develop economic research program for NOAA.
- May 29- June 29 - Dr. Tim Smith traveled to the Soviet Union and England to participate in a U.S.-U.S.S.R. scientific exchange reviewing Black Sea dolphin assessment, and to attend special Scientific Committee meetings of the International Whaling Commission on sighting surveys.
- June 1-2 - Jacqueline Jennings and Ray Stives traveled to Honolulu and Kona, Hawaii, to conduct a satellite-linked transmitter experiment.
- 4 - A meeting of the EEO Committee was held at the La Jolla Laboratory.

- 4 - Dr. Doug DeMaster traveled to San Clemente Island, CA to familiarize SWR and SWFC personnel with the research program of the Naval Air Station on the island.
- 6-8 - Dr. Reuben Lasker traveled to Woods Hole, MA to attend a fisheries meeting; to New York, NY, to discuss culturing marine organisms with Dr. Ken Gold of the Osborne Marine Laboratory; to Beaufort, NC to attend SCOR Working Group 67 on Oceanography, Marine Ecology, and Living Resources.
- 7-12 - Dr. Gary Sakagawa and Dr. Sam Herrick attended the inter-sessional meeting of the ICCAT sub-committee on skipjack tuna in Miami, FL.
- 9-10 - Fred Kellenberger traveled to Long Beach, CA to attend a FIN meeting, and to Terminal Island to attend a Groundfish Data Management meeting.
- 9-12 - Al Coan, Jr., traveled to Miami, FL to discuss data problems with the ICCAT Secretariat and other fishery scientists.
- 10 - Dave Mackett traveled to Terminal Island, CA to attend a Groundfish Data Management meeting.
- 11 - Dr. Izadore Barrett attended an Underwater Park meeting in La Jolla, California.
- 12-15 - Dr. Douglas DeMaster traveled to San Nicolas Island, CA to determine Zalophus pup production as part of an assessment procedure.
- 14-20 - Dr. Norman Bartoo traveled to Miami, FL to participate in ICCAT inter-sessional billfish workshop and to serve as rapporteur on population dynamics and stock assessment papers.
- 22-30 - Robert Owen traveled to La Paz, Mexico to present a lecture at CICIMAR.
- 22-27 - Dave Mackett traveled to Honolulu, Hawaii to assist in program planning for the Honolulu Laboratory.
- 23-26 - Dr. Izadore Barrett, Center Director, attended an Executive Leadership Seminar in San Francisco, CA.

- 24-26 - John Henderson traveled to San Clemente Island, CA to survey harbor seal and sea lion haulouts.
- 24-27 - Fred Kellenberger traveled to Honolulu, Hawaii to attend a FIN planning meeting and a NMFS/Council/State meeting on responsibilities.

Tiburon Laboratory

- May 25- - Dr. Edmund S. Hobson and James R. Chess traveled to the
- June 12 West Indies Laboratory, St. Croix, U.S. Virgin Islands, to investigate effects of planktivorous fishes on spawning and recruitment patterns of reef fishes.
- 30 - Norman J. Abramson and Dr. William H. Lenarz traveled to Sacramento, California to meet with Department of Fish and Game and Southwest Region personnel on salmon regulations.

PERSONNEL ACTIONS

Honolulu Laboratory

- June 1 - Gerald O. Palermo, Jr., Biological Aid (Wildlife) - Appointment under summer hire program.
- 15 - Robert J. Morrow, Biological Aid (Wildlife) - Appointment under summer hire program.
- Daniel R. Locey, Computer Science Student Trainee - Appointment under Federal Junior Fellow Program.
- 27 - Gary L. Steiger, Biological Aid (Fisheries) - Conversion to full-time temporary appointment.
- 28 - Paul M. Shiota - Lateral reassignment to Fishery Biologist.
- 29 - Rodney T. Watson, Biological Aid (Wildlife) - Appointment under summer hire program.
- Marlene W. L. Dung, Clerk Typist - Appointment under summer hire program.
- Daniel C. Chung, Computer Clerk - Appointment under summer hire program.

La-Jolla Laboratory

- June 7 - Sandra Paez, NOAA Junior Fellow - Return to duty.
- 14 - Richard Kiy, NOAA Junior Fellow - Return to duty.
- Sandra Paez, NOAA Junior Fellow - Promotion.
- 28 - Helen Becker, Clerk Typist - Promotion.
- Emille Cole, Clerk Typist - Resignation.
- Ron Dotson, Biological Technician - Promotion.

Tiburon Laboratory

- June 14 - Lisa M. Andrade, Biological Aid - Promotion.
- Frank J. Jacques, Biological Science Student Trainee and
 NOAA Junior Fellow - Promotion.
- Steven J. Pace, Biological Aid - Promotion.
- 28 - Pete E. Benville, Jr., Research Chemist - Promotion.

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